

WHAT IS CLAIMED IS:

1. A wavelength stabilizing apparatus for stabilizing the wavelength of a laser-beam radiated from a semiconductor laser, comprising:

5 an etalon which is obtained by cutting a quartz bulk, and includes a pair of light reflecting film layers formed on a pair of Z-cut surfaces of the etalon, respectively, and a pair of electrode layers formed on a pair of X-cut surfaces thereof,
10 respectively;

 a dither signal generator which generates a dither signal corresponding to a mechanical resonance frequency of the etalon;

 a pair of shafts which are conductive, have a pair
15 of end portions connected to the pair of X-cut surfaces of the etalon, respectively, to axially support the etalon, and are supplied with the dither signal;

 a supporting device which supports the pair of shafts;

20 a photo-detector which receives the laser-beam transmitted through the etalon and converts the received laser-beam into an electrical signal;

 an error signal generator which generates an error signal by comparing the electrical signal with the
25 dither signal; and

 a controller which controls a driving state of the semiconductor laser on the basis of the error signal to

approach the wavelength of the laser beam to an extremal value of a light transmittance of the etalon.

2. An apparatus according to claim 1, wherein the dither signal generator includes an oscillation circuit
5 having the etalon as a transducer and generating an oscillation signal as the dither signal.

3. An apparatus according to claim 1, wherein the pair of shafts are made of an elastic material, and a shafting resonance frequency of the etalon is set at
10 not less than 10 kHz when the etalon axially supported by the shafts is regarded as a material particle.

4. An apparatus according to claim 1, wherein the controller controls an injection current to the semiconductor laser or a temperature of the
15 semiconductor laser on the basis of the error signal.

5. An apparatus according to claim 1, wherein a reflectance of the light reflecting film layer is $17 \pm 5\%$.

6. An apparatus according to claim 1, wherein
20 the controller controls the driving state of the semiconductor laser to selectively stabilize the wavelength at one of a maximum value of the light transmittance of the etalon and a minimum value thereof.

7. An apparatus according to claim 1, wherein
25 a reflectance of the light reflecting film layer is $17 \pm 5\%$, and

the controller controls the driving state of the semiconductor laser to selectively stabilize the wavelength at one of a maximum value of the light transmittance of the etalon and a minimum value thereof.

8. An apparatus according to claim 1, wherein the pair of shafts have plasticity and, when an angle of an axis of the etalon with respect to the optical axis of the laser-beam is adjusted around an axis of the axial support, the shafts holds the adjusted state.

9. An apparatus according to claim 1, wherein a light signal radiated from the semiconductor laser is transmitted through a central portion of the etalon.

10. An apparatus according to claim 1, wherein the one end portion of each of shafts is connected to the central portion of a corresponding one of the X-cut surface electrode layers of the quartz etalon.

11. A wavelength stabilizing method of stabilizing the wavelength of a laser-beam radiated from a semiconductor laser, comprising:

axially supporting an etalon which is obtained by cutting a quartz bulk, and includes a pair of light reflecting film layers formed on a pair of Z-cut surfaces of the etalon, respectively, and a pair of electrode layers formed on a pair of X-cut surfaces thereof, respectively, in a pair of X-cut surfaces; oscillating the etalon by applying a dither signal

to the axially supported portion of the etalon;

sending the laser-beam into Z-cut surfaces of the etalon and passing the laser-beam between the reflecting film layers;

5 receiving the laser-beam transmitted through the etalon, and converting the received laser-beam into an electrical signal;

generating an error signal by comparing the electrical signal with the dither signal; and

10 controlling a driving state of the semiconductor laser on the basis of the error signal, to approach the wavelength of the laser beam to an extremal value of a light transmittance of the etalon.

12. A method according to claim 11, wherein the dither signal is obtained by oscillating the etalon as a transducer.

13. A method according to claim 11, wherein when the etalon is regarded as a material particle, and a shafting resonance frequency of the etalon is not less than 10 kHz.

14. A method according to claim 11, wherein the driving state is controlled an injection current to the semiconductor laser or a temperature of the semiconductor laser on the basis of the error signal.

15. A method according to claim 11, wherein a reflectance of the light reflecting film layer is set at $17 \pm 5\%$.

16. A method according to claim 11, wherein
controlling the driving state of the semiconductor
laser includes stabilizing selectively the wavelength
at one of a maximum value of the light transmittance of
the etalon and a minimum value thereof.

17. A method according to claim 11, wherein a
reflectance of the light reflecting film layer is set
at $17 \pm 5\%$, and controlling the driving state of the
semiconductor laser includes stabilizing selectively
the wavelength at one of a maximum value of the light
transmittance of the etalon and a minimum value
thereof.

18. A method according to claim 11, wherein the
wavelength to be stabilized is adjusted by adjusting,
around an axis of the axial support, the angle of an
axis of the etalon with respect to the optical axis of
the laser-beam.

19. A method according to claim 18, wherein the
etalon is held in a state in which the angle of an axis
is adjusted.